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A mixer converts RF power at one **frequency** into power at another **frequency** to make
... **Table 1. Mixer Harmonic Intermodulation** for Mini-Circuits SRA-220, ...
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[PDF] **INTERMODULATION SUPPRESSION TABLE 1. High Frequency Mixers*** **TABLE ...**

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Software Shaves Spurs In Frequency Planning

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In addition to the desired output **frequency** signal, **mixers** produce many ...
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are predominant **intermodulation frequencies**, closest to the ... MHz range.
However, over a wider **frequency**, the diode **mixer** provides a higher E factor ...
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FLO = any **frequency** in the local-oscillator (LO) band. ... a generic double-balanced
mixer or **intermodulation table mixer** can be specified. ...
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[PDF] Mixer 2x2 Spurious Response and IP2 Relationship

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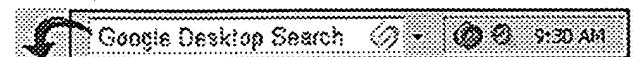
frequency < RF frequency) or the difference term between the **mixer's** LO and RF for
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[1,2] A typical "single-mixer heterodyne" technique, is shown in figure 1. ...

Figure 1 Single Mixer Heterodyne Frequency Measurement Technique ...

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Mixer and Period Counter, Resolution enhanced by heterodyne factor, No phase data.

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Heterodyne Receivers

The second method is the super-heterodyne receiver and is by far the more common method ... The mixer output and the band-pass filter output are given by ...

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Heterodyne laser mixer

Both models are based upon the heterodyne laser mixer effect. This effect is the use of a laser diode as both an optical source and mixer at the same time. ...

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[TenTec] Receivability

And by products arise from the mixer heterodyne process -- they are called mixer images and spurious products made up of integer values (of sums, ...

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Summary

The action of the heterodyne system when presented with such an input is ...

the input signal simultaneously presents the heterodyne mixer with frequency ...

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detector and as a heterodyne mixer. In the former, the non- linear dependence of the current I ... Figure 3 a shows the heterodyne mixer amplitude as the ...

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RC Stuff and links to: RC Radio

Heterodyne receivers work like this; All signals go into the aerial and a low ...

They then go to a mixer which multiplies all the incoming signals by the ...

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... in heterodyne mode or InSb mixer systems operating in homodyne mode. Both can offer similar levels of mixer noise, however, a heterodyne system requires ...

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Patent 4697284: Single-photodiode optical heterodyne mixers

An optical **heterodyne mixer** according to claim 1 wherein the combining and directing ... 1 is a diagram of the single-photodiode optical **heterodyne mixer** in ...
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- 1. Nonlinear dynamics of microwave synthesizers-stability and noise

Sancho, S.; Suarez, A.; Fernandez, T.;
Microwave Theory and Techniques, IEEE Transactions on
Volume 49, Issue 10, Oct. 2001 Page(s):1792 - 1803

[AbstractPlus](#) | [References](#) | [Full Text: PDF\(344 KB\)](#) IEEE JNL

- 2. CMOS MMICs for microwave and millimeter wave applications

Ferndahl, M.; Zirath, H.; Motlagh, B.M.; Masud, A.; Angelov, I.; Vickes, H.O.; Gevorgian, S.; Ingvarsson, F.;
Microwaves, Radar and Wireless Communications, 2004. MIKON-2004. 15th International Conference on
Volume 1, 17-19 May 2004 Page(s):237 - 248 Vol.1

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1 Modeling for analog circuits: High-frequency noise in RF active CMOS mixers

Payam Heydari

January 2004 **Proceedings of the 2004 conference on Asia South Pacific design automation: electronic design and solution fair ASP-DAC '04 , Proceedings of the 2004 conference on Asia South Pacific design automation: electronic design and solution fair ASP-DAC '04**

Full text available: [pdf\(188.90 KB\)](#)

Additional Information: [full citation](#), [abstract](#), [references](#)

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A new analytical model for high-frequency noise in RF active CMOS mixers such as single-balanced and double-balanced architectures is presented. The analysis includes the contribution of non-white gate-induced noise at the output as well as the spot noise figure (NF) of the RF CMOS mixer, while accounting for the non-zero correlation between the gate-induced noise and the channel thermal noise. The noise contribution of the RF transconductor as well as the switching pair on the output noise is di ...

2 Simulation methods for RF integrated circuits



Ken Kundert

November 1997 **Proceedings of the 1997 IEEE/ACM international conference on Computer-aided design**

Full text available: [pdf\(97.56 KB\)](#)

Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

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The principles employed in the development of modern RF simulators are introduced and the various techniques currently in use, or expected to be in use in the next few years, are surveyed. Frequency and time domain techniques are presented and contrasted, as are steady state and envelope techniques and large and small signal techniques.

Keywords: RF integrated circuits, envelope techniques, integrated circuit modelling, modern RF simulators, simulation methods, small signal techniques, state techniques, time domain techniques

3 Advanced simulation techniques: Time-domain steady-state simulation of frequency-dependent components using multi-interval Chebyshev method



Baolin Yang, Joel Phillips

June 2002 **Proceedings of the 39th conference on Design automation**

Full text available:  pdf(139.65 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

Simulation of RF circuits often demands analysis of distributed component models that are described via frequency-dependent multi-port Y, Z, or S parameters. Frequency-domain methods such as harmonic balance are able to handle these components without difficulty, while they are more difficult for time-domain simulation methods to treat. In this paper, we propose a hybrid frequency-time approach to treat these components in steady-state time-domain simulations. Efficiency is ...

Keywords: RF circuit simulation, S parameter, frequency dependent

4 Advanced simulation techniques: A time-domain RF steady-state method for closely spaced tones

Jaijeet Roychowdhury

June 2002 **Proceedings of the 39th conference on Design automation**

Full text available:  pdf(543.95 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

Verifying circuits with two or more closely-spaced driving frequencies is important in RF and wireless communications, e.g., in the design of down-conversion mixers. Existing steady-state calculation methods, like harmonic balance, rely on Fourier series expansions to find the difference-frequency components typically of interest. Time-domain methods are, however, better suited for circuits with strong nonlinearities such as switching. Towards this end, we present a purely time-domain met ...

Keywords: MPDE, RF switching mixers, analog, analog/RF simulation, artificial time scales, continuation methods, difference-frequency time scales, envelope, harmonic balance, homotopy, mixed-signal, multi-time PDEs, shooting

5 Simulation of high-Q oscillators

M. Gourary, S. Ulyanov, M. Zharov, S. Rusakov

November 1998 **Proceedings of the 1998 IEEE/ACM international conference on Computer-aided design**

Full text available:  pdf(791.27 KB) Additional Information: [full citation](#), [references](#), [index terms](#)

6 Emerging design and tool challenges in RF and wireless applications: New techniques for non-linear behavioral modeling of microwave/RF ICs from simulation and nonlinear microwave measurements

David E. Root, John Wood, Nick Tufillaro

June 2003 **Proceedings of the 40th conference on Design automation**

Full text available:  pdf(337.31 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

This paper compares and contrasts recent nonlinear behavioral modeling techniques designed for microwave and RFIC applications which arise in radio and communication systems, and in the design of broad-band nonlinear components used for microwave instrumentation. These techniques include dynamic neural networks and nonlinear time series models in the time-domain, nonlinear describing functions in the frequency domain, and envelope-based methods in mixed time and frequency domains. Approaches to ...

Keywords: MMICs, RFICs, behavioral modeling, circuit simulation, nonlinear dynamics, nonlinear modeling, nonlinear simulation

7 Tools and methodology for RF IC design

Al Dunlop, Alper Demir, Peter Feldmann, Sharad Kapur, David Long, Robert Melville, Jaijeet Roychowdhury

May 1998 **Proceedings of the 35th annual conference on Design automation**

Full text available: [!\[\]\(fa6f3af6bfa46c5d4a2d362681095beb_img.jpg\) pdf\(326.34 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)
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We describe powerful new techniques for the analysis of RF circuits.

Next-generation CAD tools based on such techniques should enable RF designers to obtain a more accurate picture of how their circuits will operate. These new simulation capabilities will be essential in order to reduce the number of design iterations needed to produce complex RFICs.

Keywords: custom sizing, migration, timing optimazation

8 Poster session 2: A high performance CMOS direct down conversion mixer for UWB system

Anh-Tuan Phan, Chang-Wan Kim, Min-Suk Kang, Sang-Gug Lee, Chun-Deok Su, Hoon-Tae Kim

April 2004 **Proceedings of the 14th ACM Great Lakes symposium on VLSI**

Full text available: [!\[\]\(e9474ce1d70442456f8fe9c393ea149c_img.jpg\) pdf\(210.49 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

This paper represents a high performance wideband CMOS direct down-conversion mixer for UWB based on 0.18 μ m CMOS technology. The proposed mixer uses the current bleeding technique and an extra resonant inductor to improve the conversion gain, noise figure (NF) and linearity. Also, with an extra inductor and the careful choosing of transistor sizes, the mixer has a very low flicker noise. The shunt resistor matching is applied to have a 528MHz bandwidth matching at 50 Ohm. The simulation re ...

Keywords: UWB, direct down conversion mixer, flicker noise, mixer

9 Circuits for low power wireless: A CMOS even harmonic mixer with current reuse for low power applications

Ming-Feng Huang, Shuenn-Yuh Lee, Chung J. Kuo

August 2004 **Proceedings of the 2004 international symposium on Low power electronics and design**

Full text available: [!\[\]\(9a795c4c0c43d0827b424565265fc8e6_img.jpg\) pdf\(281.20 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

This paper presents a novel topology for the even harmonic mixer (EHM). The proposed mixer employs current reuse and double frequency circuits in the RF input stage and LO stage, respectively, to improve its linearity and isolation. In addition, the proposed topology has the advantage of the low power consumption. In order to demonstrate the benefits of the proposed mixer, theoretical analyses of conversion gain and linearity have been described in details. The measured results reveal that the p ...

Keywords: current reuse, low power, mixer

10 Numerical techniques for simulation: A frequency relaxation approach for analog/RF system-level simulation

Xin Li, Yang Xu, Peng Li, Padmini Gopalakrishnan, Lawrence T. Pileggi

June 2004 **Proceedings of the 41st annual conference on Design automation**Full text available:  pdf(191.49 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

The increasing complexity of today's mixed-signal integrated circuits necessitates both top-down and bottom-up system-level verification. Time-domain state-space modeling and simulation approaches have been successfully applied for such purposes (e.g. Simulink); however, analog circuits are often best analyzed in the frequency domain. Circuit-level analyses, such as harmonic balance, have been successfully extended to the frequency domain [2], but these algorithms are impractical for simulating ...

Keywords: analog/RF circuits, system-level simulation**11 Design methodology used in a single-chip CMOS 900 MHz spread-spectrum wireless transceiver**

Jacob Rael, Ahmadreza Rofougaran, Asad Abidi

May 1998 **Proceedings of the 35th annual conference on Design automation**Full text available:  pdf(686.97 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)
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This paper describes the simulation and layout techniques used and developed in the design of a single-chip CMOS 900 MHz spread-spectrum wireless transceiver:

Keywords: ISM frequency band, RF CMOS, digital radio, spread spectrum communication, transceiver**12 Nonlinear model order reduction: Analog and RF circuit macromodels for system-level analysis**

Xin Li, Peng Li, Yang Xu, Lawrence T. Pileggi

June 2003 **Proceedings of the 40th conference on Design automation**Full text available:  pdf(205.21 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

Design and validation of mixed-signal integrated systems require system-level model abstractions. Generalized Volterra series based models have been successfully applied for analog and RF component macromodels, but their complexity can sometimes limit their utility for time-varying systems and large circuits with complex device models or numerous parasitics. In this paper we propose simple and efficient analog and RF circuit macromodels that provide accurate model abstractions for large, complex ...

Keywords: analog/RF circuits, macromodel**13 Analogue Fault Modelling and Simulation for Supply Current Monitoring**

M. Zwolinski, C. Chalk, B. R. Wilkins

March 1996 **Proceedings of the 1996 European conference on Design and Test**Full text available:  pdf(574.67 KB) Additional Information: [full citation](#), [abstract](#)
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Fault simulation of analogue circuits is a very CPU intensive task. This paper describes a technique to increase the speed of fault simulation. The effects of bridging faults within operational amplifiers have been classified according to the externally observable behaviour reducing the number of fault simulations by two thirds. Parameterisable macromodels have been written in which both fault-free specifications and faulty effects can be modelled. The supply current is also modelled. These macr ...

Keywords: Analogue Modelling, Circuit Simulation, Testing, SPICE

14 Session 9: Design techniques for low power high bandwidth upconversion in CMOS 

Carl De Ranter, Michiel Steyaert

August 2002 **Proceedings of the 2002 international symposium on Low power electronics and design**

Full text available:  pdf(285.03 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

An upconverter topology for low power, high bandwidth applications is presented. Using specific circuit techniques and local circuit-level optimization, the power consumption of the total system comprising an on-chip LC-type VCO, a polyphase network quadrature generator, a linear mixer block and an RF-current buffer, has been minimized. A chip has been designed and manufactured in a 0.25&mug;m CMOS technology. The VCO oscillates between 1.68 GHz and 2 GHz. Driven by an external LO, the transmitt ...

Keywords: CMOS, RF design, analog, low power, oscillators, upconversion

15 Efficient time-domain simulation of telecom frontends using a complex damped exponential signal model 

P. Vanassche, G. Gielen, W. Sansen

March 2001 **Proceedings of the conference on Design, automation and test in Europe**

Full text available:  pdf(133.26 KB) Additional Information: [full citation](#), [references](#), [index terms](#)

16 An 8mA, 3.8dB NF, 40dB gain CMOS front-end for GPS applications 

F. Svelto, S. Deantoni, G. Montagna, R. Castello

August 2000 **Proceedings of the 2000 international symposium on Low power electronics and design**

Full text available:  pdf(1.75 MB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

A fully differential 0.35&mug;m CMOS LNA plus mixer, tailored to a double conversion architecture, for GPS applications has been realized. The LNA makes use of an inductively degenerated input stage and a resonant LC load, featuring 12% frequency tuning, accomplished by an MOS varactor. The mixer is a Gilbert cell like, in which an NMOS and a PMOS differential pair, shunted together, realize the input stage. This topology allows to save power, for given mixer gain and linearity. The front-e ...

Keywords: CMOS, circuit-analog, communication, design, low-power design, low-power dissipation, performances trade-off

17 Time-domain non-Monte Carlo noise simulation for nonlinear dynamic circuits with arbitrary excitations 

Alper Demir, Edward W. Y. Liu, Alberto L. Sangiovanni-Vincentelli

November 1994 **Proceedings of the 1994 IEEE/ACM international conference on Computer-aided design**Full text available:  pdf(840.83 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

A new, time-domain, non-Monte Carlo method for computer simulation of electrical noise in nonlinear dynamic circuits with arbitrary excitations is presented. This time-domain noise simulation method is based on the results from the theory of stochastic differential equations. The noise simulation method is general in the sense that any nonlinear dynamic circuit with any kind of exci ...

18 CAD for RF circuits 

P. Wambacq, G. Vandersteen, J. Phillips, J. Roychowdhury, W. Eberle, B. Yang, D. Long, A. Demir

March 2001 **Proceedings of the conference on Design, automation and test in Europe**Full text available:  pdf(396.98 KB) Additional Information: [full citation](#), [references](#), [citations](#), [index terms](#)**19 Low Cost Analog Testing of RF Signal Paths** 

Marcelo Negreiros, Luigi Carro, Altamiro A. Susin

February 2004 **Proceedings of the conference on Design, automation and test in Europe - Volume 1**Full text available:  pdf(374.70 KB) Additional Information: [full citation](#), [abstract](#), [citations](#), [index terms](#)

A low cost method for testing analog RF signal paths suitable for BIST implementation in a SoC environment is described. The method is based on the use of a simple and low-cost one-bit digitizer that enables the reuse of processor and memory resources available in the SoC, while incurring little analog area overhead. The proposed method also allows a constant load to be observed by the circuit, since no switches or muxes are needed for digitizing specific test points. Mathematical background and ...

20 Efficient AC and noise analysis of two-tone RF circuits 

Ricardo Telichevesky, Ken Kundert, Jacob White

June 1996 **Proceedings of the 33rd annual conference on Design automation**Full text available:  pdf(253.02 KB) Additional Information: [full citation](#), [references](#), [citations](#), [index terms](#)

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1 Modeling and simulation of high-frequency integrated circuits based on scattering parameters

A. T. Yang, C. H. Chan, J. T. Yao, R. R. Daniels, J. P. Harrang

June 1991 **Proceedings of the 28th conference on ACM/IEEE design automation**Full text available: [pdf\(622.93 KB\)](#) Additional Information: [full citation](#), [references](#), [citations](#), [index terms](#)

2 Advanced simulation techniques: Time-domain steady-state simulation of frequency-dependent components using multi-interval Chebyshev method

Baolin Yang, Joel Phillips

June 2002 **Proceedings of the 39th conference on Design automation**Full text available: [pdf\(139.65 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

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Keywords: RF circuit simulation, S parameter, frequency dependent

3 Numerical techniques for simulation: A frequency relaxation approach for analog/RF system-level simulation

Xin Li, Yang Xu, Peng Li, Padmini Gopalakrishnan, Lawrence T. Pileggi

June 2004 **Proceedings of the 41st annual conference on Design automation**Full text available: [pdf\(191.49 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

The increasing complexity of today's mixed-signal integrated circuits necessitates both top-down and bottom-up system-level verification. Time-domain state-space modeling and simulation approaches have been successfully applied for such purposes (e.g. Simulink); however, analog circuits are often best analyzed in the frequency domain. Circuit-level analyses, such as harmonic balance, have been

successfully extended to the frequency domain [2], but these algorithms are impractical for simulating ...

Keywords: analog/RF circuits, system-level simulation

- 4 Efficient time-domain simulation of telecom frontends using a complex damped exponential signal model

P. Vanassche, G. Gielen, W. Sansen

March 2001 **Proceedings of the conference on Design, automation and test in Europe**

Full text available:  pdf(133.26 KB) Additional Information: [full citation](#), [references](#), [index terms](#)

- 5 Session 6B: analog and RF simulation: Efficient finite-difference method for quasi-periodic steady-state and small signal analyses

Baolin Yang, Dan Feng

November 2000 **Proceedings of the 2000 IEEE/ACM international conference on Computer-aided design**

Full text available:  pdf(117.60 KB) Additional Information: [full citation](#), [abstract](#), [references](#)

This paper discusses a finite-difference mixed frequency-time (MFT) method for the quasi-periodic steady-state analysis and introduces the quasi-periodic small signal analysis. A new approach for solving the huge nonlinear system the MFT finite difference method generates from practical circuits is given, which makes efficient frequency-sweeping quasi-periodic small-signal analysis possible. The new efficient solving technique works well with the Krylovsubspace recycling or reuse [4], which can ...

- 6 Nonlinear model order reduction: Analog and RF circuit macromodels for system-level analysis

Xin Li, Peng Li, Yang Xu, Lawrence T. Pileggi

June 2003 **Proceedings of the 40th conference on Design automation**

Full text available:  pdf(205.21 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

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Keywords: analog/RF circuits, macromodel

- 7 CAD for RF circuits

P. Wambacq, G. Vandersteen, J. Phillips, J. Roychowdhury, W. Eberle, B. Yang, D. Long, A. Demir

March 2001 **Proceedings of the conference on Design, automation and test in Europe**

Full text available:  pdf(396.98 KB) Additional Information: [full citation](#), [references](#), [citations](#), [index terms](#)

8 Test synthesis for mixed-signal SOC paths

Sule Ozev, Ismet Bayraktaroglu, Alex Orailoglu

January 2000 **Proceedings of the conference on Design, automation and test in Europe**Full text available: [pdf\(98.68 KB\)](#)[Publisher Site](#)Additional Information: [full citation](#), [references](#), [index terms](#)**9 Analysis and optimization of substrate noise coupling in single-chip RF transceiver design**

Adil Koukab, Kaustav Banerjee, Michel Declercq

November 2002 **Proceedings of the 2002 IEEE/ACM international conference on Computer-aided design**Full text available: [pdf\(462.15 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

The relentless move toward single chip integration of RF, analog and digital blocks results in significant noise coupling effects that can degrade performance and hence, should be controlled. In this paper, we propose a practical methodology that uses a suite of commercial tools in combination with a high-speed extractor based on an innovative semi-analytical method to deal with noise coupling problems, and enable RF designers to achieve a first silicon-success of their chips. The integration of ...

**10 A multi-interval Chebyshev collocation method for efficient high-accuracy RF circuit simulation**

Baolin Yang, Joel Phillips

June 2000 **Proceedings of the 37th conference on Design automation**Full text available: [pdf\(138.88 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

Most RF circuit analysis tools use either shooting-Newton or harmonic balance methods. Neither can efficiently achieve high accuracy on strongly nonlinear circuits possessing waveforms with rapid transitions. We present a multi-interval-Chebyshev (MIC) method that discretizes the circuit equations by dividing the simulation domain into a set of intervals whose size is adaptively chosen and using Chebyshev polynomials to represent the solution in each interval. The MIC method has excellent s ...

**11 Model reduction of time-varying linear systems using approximate multipoint Krylov-subspace projectors**

Joel R. Phillips

November 1998 **Proceedings of the 1998 IEEE/ACM international conference on Computer-aided design**Full text available: [pdf\(785.79 KB\)](#) Additional Information: [full citation](#), [references](#), [citations](#), [index terms](#)**12 A Linear-Centric Modeling Approach to Harmonic Balance Analysis**

P. Li, L. Pileggi

March 2002 **Proceedings of the conference on Design, automation and test in Europe**Full text available: [pdf\(221.12 KB\)](#)[Publisher Site](#)Additional Information: [full citation](#), [abstract](#)

In this paper we propose a new harmonic balance simulation methodology based on a linear-centric modeling approach. A linear circuit representation of the nonlinear devices and associated parasitics is used along with corresponding time and frequency domain inputs to solve for the nonlinear steady-state response via successive chord (SC) iterations. For our circuit examples this approach is shown to be up to 60x more run-time efficient than traditional Newton-Raphson (N-R) based iterative methods, while ...

13 A Hybrid Approach to Nonlinear Macromodel Generation for Time-Varying Analog Circuits

Peng Li, Xin Li, Yang Xu, Lawrence T. Pileggi

November 2003 **Proceedings of the 2003 IEEE/ACM international conference on Computer-aided design**

Full text available:  pdf(312.78 KB) Additional Information: [full citation](#), [abstract](#), [index terms](#)

Modeling frequency-dependent nonlinear characteristics of complex analog blocks and subsystems is critical for enabling efficient verification of mixed-signal system designs. Recent progress has been made for constructing such macromodels, however, their accuracy and/or efficiency can break down for certain problems, particularly those with high-Q filtering. In this paper we explore a novel hybrid approach for generating accurate analog macromodels for time-varying weakly nonlinear circuits. The combin ...

14 Layout tools for analog ICs and mixed-signal SoCs: a survey

Rob A. Rutenbar, John M. Cohn

May 2000 **Proceedings of the 2000 international symposium on Physical design**

Full text available:  pdf(247.03 KB) Additional Information: [full citation](#), [references](#)

15 Model order reduction and variational techniques for parasitic analysis:

Exploiting input information in a model reduction algorithm for massively coupled parasitic networks

L. Miguel Silveira, Joel R. Phillips

June 2004 **Proceedings of the 41st annual conference on Design automation**

Full text available:  pdf(117.34 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

In this paper we present a model reduction algorithm that circumvents some of the issues encountered for parasitic networks with large numbers of input/output "ports". Our approach is based on the premise that for such networks, there are typically strong dependencies between the input waveforms at different network "ports". We present an approximate truncated balanced realizations procedure that, by exploiting such correlation information, produces much more compact models compared to standard ...

Keywords: interconnect, model order reduction, parasitic

16 Modeling for analog circuits: High-frequency noise in RF active CMOS mixers

Payam Heydari

January 2004 **Proceedings of the 2004 conference on Asia South Pacific design automation: electronic design and solution fair ASP-DAC '04 , Proceedings of the 2004 conference on Asia South Pacific design automation: electronic design and solution fair ASP-DAC '04**

Full text available:  pdf(188.90 KB)Additional Information: [full citation](#), [abstract](#), [references](#) Publisher Site

A new analytical model for high-frequency noise in RF active CMOS mixers such as single-balanced and double-balanced architectures is presented. The analysis includes the contribution of non-white gate-induced noise at the output as well as the spot noise figure (NF) of the RF CMOS mixer, while accounting for the non-zero correlation between the gate-induced noise and the channel thermal noise. The noise contribution of the RF transconductor as well as the switching pair on the output noise is di ...

17 Simultaneous buffer and wire sizing for performance and power optimization 

J. Cong, C. Koh, K. Leung

August 1996 **Proceedings of the 1996 international symposium on Low power electronics and design**Full text available:  pdf(223.18 KB) Additional Information: [full citation](#), [references](#), [citations](#), [index terms](#)**18 Simulation methods for RF integrated circuits** 

Ken Kundert

November 1997 **Proceedings of the 1997 IEEE/ACM international conference on Computer-aided design**Full text available:  pdf(97.56 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#) Publisher Site

The principles employed in the development of modern RF simulators are introduced and the various techniques currently in use, or expected to be in use in the next few years, are surveyed. Frequency and time domain techniques are presented and contrasted, as are steady state and envelope techniques and large and small signal techniques.

Keywords: RF integrated circuits, envelope techniques, integrated circuit modelling, modern RF simulators, simulation methods, small signal techniques, state techniques, time domain techniques

19 Time-domain non-Monte Carlo noise simulation for nonlinear dynamic circuits with arbitrary excitations 

Alper Demir, Edward W. Y. Liu, Alberto L. Sangiovanni-Vincentelli

November 1994 **Proceedings of the 1994 IEEE/ACM international conference on Computer-aided design**Full text available:  pdf(840.83 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

A new, time-domain, non-Monte Carlo method for computer simulation of electrical noise in nonlinear dynamic circuits with arbitrary excitations is presented. This time-domain noise simulation method is based on the results from the theory of stochastic differential equations. The noise simulation method is general in the sense that any nonlinear dynamic circuit with any kind of exci ...

20 Simulating 3-D retarded interconnect models using complex frequency hopping (CFH) 

Eli Chiprout, Hansruedi Heeb, Michel S. Nakhla, Alber E. Ruehli

November 1993 **Proceedings of the 1993 IEEE/ACM international conference on Computer-aided design**Full text available:  pdf(665.42 KB) Additional Information: [full citation](#), [references](#), [citations](#)

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